MATHEMATICS OF FINANCIAL PROBLEMS.

By L. M. Webster.

Dr. Davenport, of the University of Illinois, says: "We have entered upon an era of universal education which means the education of all sorts of people for all sort of purposes. It must not only fit for the so-called learned professions, it must also train for the commercial and industrial world." Dr. Davenport has certainly struck the keynote of to-day's topic. Most teachers admit that the pendulum has swung too far to the cultural side and that we must introduce the commercial and industrial factors, not to the exclusion of the cultural; it is possible to have our work broadened to the exclusion of no element. We can even emphasize the cultural by bringing the laws of higher mathematics into effectual contact with the daily routine of the mercantile house. Great colleges and universities record with pride the achievements of their graduates. This is but a recognition that the highest product of their training is the disciplined mind at work. While "experience is the best teacher" is an adage as true as it is old, statistics show that a mind trained for the special line of work to be undertaken is a valuable asset. Acknowledging that the Perry plan has some advantages, I still hold that the worker in mathematical fields, at least, does more efficient work in the ratio of his understanding of the principles he is applying. It is only a few years ago that this was recognized by the establishment of commercial high schools and courses in colleges and universities dealing even indirectly with the problems of great corporations. The value of these courses has been demonstrated but we must look to the teacher of financial problems to so standardize his work that college faculties will allow its full measure of credit. The war has called thousands. Their posts are being filled by graduates and undergraduates who have been obliged to assume responsibility with more meagre equipment than their older brothers. I understand that in one New York City high school the registration is 1,000 less than it was a year ago. Are these boys ready for the

work they are undertaking? Have they been so trained that they can apply their mathematics to the problems which will confront them? They have probably taken two years each of algebra and geometry; perhaps trigonometry or solid geometry if they have been preparing for college; have they learned in the algebra course that computation of compound interest is a practical application of geometric series, that present worth is an illustration of negative exponents? Can they use the laws of logarithms to express the conditions they will meet in the amortization of interest-bearing debts? Do they hold the tool of the successive discount formula, can they calculate the present worth of a perpetuity, the value of a foreborne annuity, or even the annuity that a saving of $1 per week will purchase. I believe that the place to derive these formulæ and emphasize their application to the financial world is the classroom. The time to master them is not when, as an employee, curiosity prompts investigation of tables. Each one of us would, indeed, feel guilty in slighting the Pythagorean formula. We apply it wherever and whenever we can from the day the student attacks the proposition to the hour he completes his calculus, but do we teach Euler's amortization equation? In comparing the two does not the latter afford ample opportunity for the mathematical gymnastics used in this discussion of series, exponential equations, and rates; and is it not of far greater value to the student who seeks a position in the financial world?

Can we not spend more time on graph work. All large corporations are using this mode of interpretation. Railroads seem to cling to the step method; and the straight-line graphs and the Ben Day rods are in universal favor. There seems to be no general satisfactory method of graphing three variables. As teachers of analytics we delight in showing our pupils why the parabola is called the square root conic and the hyperbola the constant product and it is on account of their practical value that we consider the cissoid and conchoid as milestones. In calculus we aim to reach as soon as possible maxima minima, or the discussion of rates. We are sure to use the catenary in our first lesson on hyperbolic functions; but are we using to their fullest value these tools, legacies of master minds, sharpened by their correlation with the other sciences and polished to an immeas-

urable fineness by their constant use in pure mathematical fields if we are silent about their value in the financial world?

I realize what the commercial high schools are doing. I have visited classrooms and enjoyed the work. Every problem had its practical side. My plea is for the application of college mathematics to the financial problems that are confronting us. It will not make our work any the less technical to include applications to bond issues and sinking funds. I think we would keep the same high standard and add a new dignity. We would establish a means of bringing abstract truths into effectual contact with daily business.

Columbia, New York University, Chicago University, and many others are offering courses in finance in extension departments. The Wall Street Division of New York University School of Commerce, Accounts and Finance is in its third year. Its growth measures the great development in our financial institutions, both as regards numbers and their methods of reaching the greatest efficiency. The close co-operation between education and the problems of the financial world is the keynote of the curriculum. The student body includes managers of financial departments and clerks seeking advancement. I have not been able to learn what proportion of the students are college graduates to whom a course in higher mathematics applied to financial problems would have appealed.

The business of the country to-day is war and the great trust and banking concerns are meeting the struggle against the odds of a greater volume of work, the loss of experienced workers, and the blunders of novices. Cannot the colleges help by supplying men and women who can enter the financial world armed with *practical* technique, those who as students have correlated higher mathematics with commercial law.

Let me give you a few figures. The New York City Clearing House passes annually $100,000,000,000. These clearings are plotted and distributed each week. In the United States there are about 200 clearing houses serving over 2,500 banks which employ over 10,000 in the capacity of experts in financial lines.

Again graphs of deposits, resources, commodity prices, absorption of capital, velocity of absorption of money and thousands of other conditions are published weekly. Many college

graduates have entered this field within the past three years and there is room for many more. That the business world is ready to co-operate with the colleges there is no doubt.

Statistics show that the college-bred man goes up the ladder with much more rapid strides than his fellow worker who climbs by experience. But, ought not a college graduate to have the equipment for an advanced position in the financial field just as the graduate of a technical school has for his life work? In other words, is not an intensive course in financial mathematics valuable? Is not to-day the time to standardize such a course?

The world is looking to institutions and individuals for help along many lines, not the least of which is efficiency in the financial field. After the great struggle is over the changes in education will no doubt be radical. Surely industrial mathematics will be emphasized, but the mathematics of finance will be a controlling factor.

HUNTER COLLEGE,
NEW YORK CITY.

"To be true to duty;
To maintain self-respect;
To keep memory unsullied by any wrong;
To be faithful to a friend, generous to a foe,
And upright in all the relations of life—
This is success."